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Conference Abstract

Automatic Pollen Species Image Identification

Marcel Polling[‡], Hugo J. De Boer[§], Timme Donders[|], Fons J. Verbeek[¶], Barbara Gravendeel[‡]

‡ Naturalis Biodiversity Center, Leiden, Netherlands
§ University of Oslo, Natural History Museum, Oslo, Norway
| University of Utrecht, Utrecht, Netherlands
¶ Leiden Institute for Advanced Computer Science, Leiden University, Leiden, Netherlands

Corresponding author: Marcel Polling (marcel.polling@naturalis.nl)

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Abstract

Recent data shows increasing numbers of hay fever patients, with approximately 10-30% of the population affected worldwide (Pawankar et al. 2011). This increase is most likely caused by prolonged and intensified pollen seasons which in turn have been linked to increased CO_2 concentrations (Ziska et al. 2003, D'Amato et al. 2007, Albertine et al. 2014). Apart from this, especially in cities, the so-called 'heat island effect' enables exotic plant species to establish themselves there. In the Netherlands alone, six new species settle in cities on a yearly basis and some of these are severely allergenic (Denters 2004). Pollen concentrations in the air are currently monitored using pollen samplers that collect pollen on sticky traps. These are checked manually under the microscope, a process that requires highly trained specialists. Moreover, microscopic pollen identification rarely allows discrimination of pollen types at species or even genus level even though the allergenicity may be very different. While there has been progress in automating the microscope using machine learning, automatic microscopes have not been able to systematically identify pollen to the species level. We designed an automated approach identify a predefined set of pollen on microscopic pollen samples. We use 2D light microscope images and a confocal fluorescence microscope for 3D images to create a reference dataset of highly similar pollen species to train automated image recognition software, and compare the results. The most accurate method will be used to apply to a pollen sample time series (1970-present) to find trends in allergenic pollen species over time. Here I present the first results of this research and the challenges to overcome.

Keywords

convolutional neural networks, hay fever, machine learning, pollen

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Marcel Polling

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